



Notes on the genus *Mada* Mulsant with description of a new Andean species (Coleoptera: Coccinellidae: Epilachnini)

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Abstract

Mada andeana, a **new species** from the Andes is here described. Diagnostic characters are illustrated for both male and female. *Mada durantae* González et Gómez is here synonymized with *Mada inepta* (Gorham), **new synonymy**.

Key words: Entomology, taxonomy, Cucujoidea, phytophagous, ladybird beetle, Peru, Ecuador

Introduction

Epilachnini is a large tribe of herbivorous ladybird beetles containing 25 genera with about 1,050 species distributed worldwide (Jadwiszczak & Węgrzynowicz 2003; Szawaryn 2011; 2014; Szawaryn & Tomaszewska 2013, 2014; Tomaszewska & Szawaryn 2013, 2014).

The genus *Mada* was described by Mulsant in 1850 as a subgenus of *Epilachna* Chevrolat. Korschefsky (1931) in his catalogue elevated *Mada* to the genus level. In his revision, Gordon (1975) redescribed 13 previous species and described 18 new ones. Subsequently, Gordon & Almeida (1986a, 1986b, 1988) described twelve additional species. González & Gómez (2013) described *M. durantae* González & Gómez from Colombia, which is here synonymized with *M. inepta* (Gorham). Currently, 43 species have been described.

Representatives of the genus *Mada* are present in Mesoamerica and South America. The genus *Mada* is characterized by its narrow, transverse labrum and double tarsal claw with an additional large basal tooth (Fig. 10). The genus is not homogeneous and Gordon (1975) concluded that it probably is not monophyletic. The variable characters are, for example, as follows: the presence of apical spurs on tibiae; the presence of depressions for receiving apices of middle and hind femora on epipleuron; the shape of abdominal postcoxal lines, whether rounded or strongly angulate. Further taxonomic investigation of the genus *Mada* is needed.

During recent examination of the new material from Ecuador provided by Lech Borowiec and Rafał Ruta, and undetermined material from the National Museum of Natural History in Washington, a new species of *Mada* was found and it is described below as *M. andeana* **sp. nov.**

Material and methods

Specimens used in this study are deposited in the following collections:

DBET	Department of Biodiversity and Evolutionary Taxonomy, University of Wrocław, Wrocław, Poland;
LBC	Lech Borowiec private collection;
MZPW	Museum and Institute of Zoology PAS, Warszawa, Poland;
NHM	Natural History Museum, London, United Kingdom;
RRC	Rafał Ruta private collection;
USNM	United States National Museum of Natural History, Washington, USA.

Measurements were made using an ocular micrometer attached to an Olympus SZH-10 dissecting microscope. Measurements recorded were as follows: (TL) total body length, from apical margin of clypeus to apex of elytra; (PL) pronotal length, from the middle of anterior margin to margin of basal foramen; (PW) pronotal width at widest part; (EL) elytral length along suture, including scutellum; (EW) elytral width across both elytra at widest part. Male genitalia were dissected, cleared in 10% solution of KOH, and subsequently transferred to glycerol on a slide for further study. After examination the genitalia were transferred to a microvial and pinned beneath the specimen. Digital photographs were made using a Leica digital camera mounted on microscope. Terminology used in this paper follows Lawrence *et al.* (2011).

Systematics

Mada andeana sp. nov.

(Figs. 1–15)

Etymology. The species is named after the Andes, where the type series was collected.

Diagnosis. This species is quite easily distinguishable from other *Mada* species by the glabrous surface of elytra and characteristic colouration (for most of the specimens) with light-brown elytra with base, lateral margins and suture black. Male genitalia, with penis apically truncate (not pointed) and penis guide pointed and widest in mid part, are distinctively different from other described species.

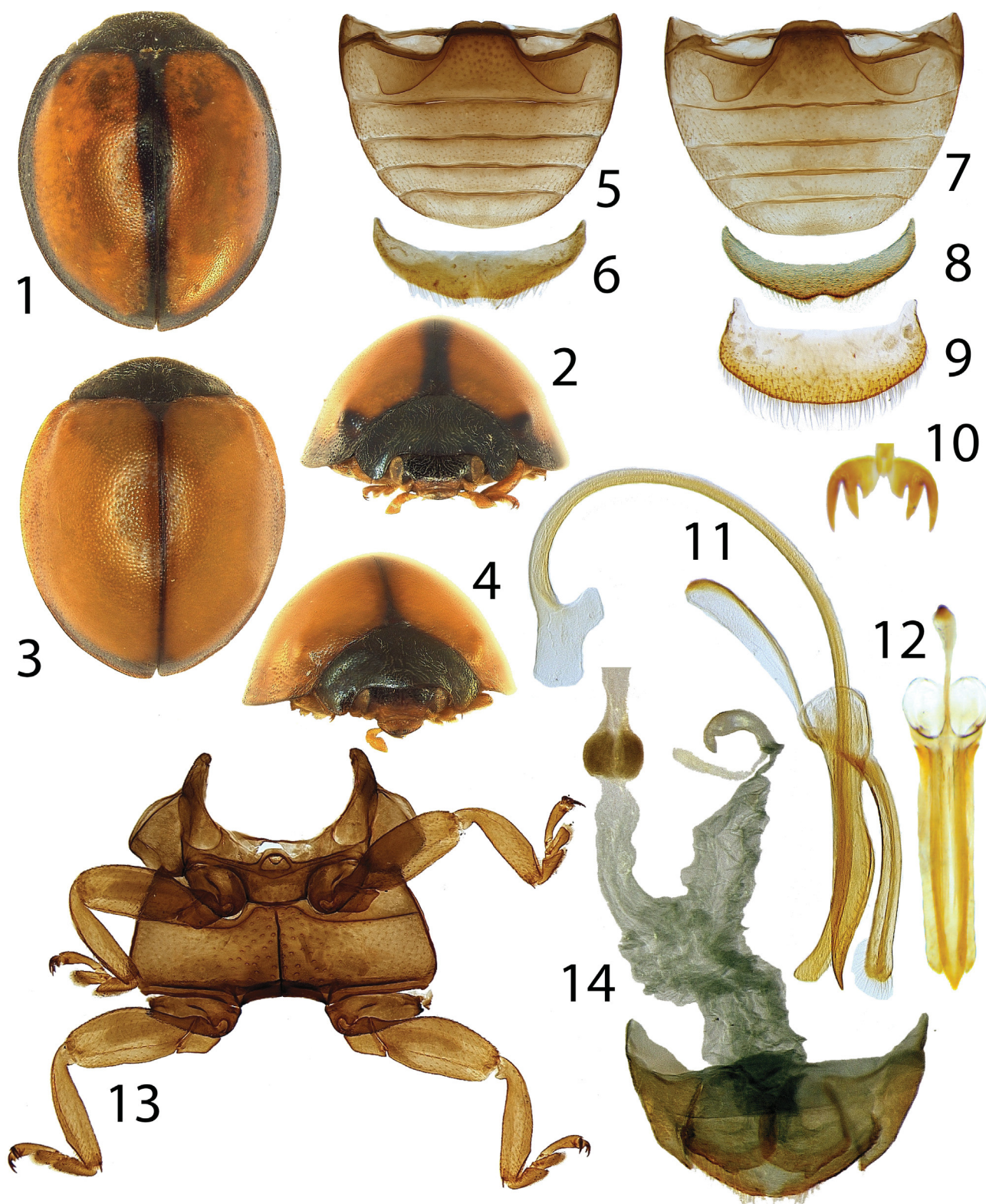
Description. Length 3.5–4.3 mm; width 3.0–3.4 mm; TL/EW = 1.17–1.26; PL/PW = 0.43–0.57; PL/EL = 0.24–0.28; PW/EW = 0.50–0.62; EL/EW = 1.00–1.09.

Body oval, convex; pronotum pubescent, elytra with sparse pubescence at basal and lateral margins only. Head black with anterior margin brown (Fig. 2); pronotum and scutellum black; mouthparts yellowish-brown; elytra light-brown with base, humeral angles, suture and lateral margin black (Fig. 1). Ventral side black with legs and abdomen light-brown. Head and pronotum punctate; elytron dually punctate with punctures almost the same size. *Variation:* two females totally brown with only pronotum and scutellum black, and posterior angles of elytron darkened (Figs. 3, 4).

Head exposed, transverse; ventral antennal grooves present. Eye finely faceted, with inner orbits emarginated antero-medially. Antennal insertions exposed in front of eyes, close to inner eye margins, with distance between antennal sockets more than six times the distance between antennal socket and inner margin of eye. Antenna shorter than width of head, 11-segmented; scape large, swollen, about twice as long as pedicel; pedicel longer than wide, swollen; antennomere 3 elongate, about as long as antennomeres 4–6 combined; antennomeres 4 and 5 subquadrate; antennomere 6 small, transverse, shorter and narrower than antennomere 5; antennomeres 7 and 8 transverse; antennal club relatively compact, 3-segmented, asymmetrical. Clypeus transverse; labrum transverse with anterior part membranous, covered with setae, anterior margin shallowly emarginate.

Pronotum transverse, widest at base and gradually narrowing anteriorly; anterior and hind margins not bordered; disc convex, finely punctate. Prothoracic hypomeron smooth; notosternal suture distinct; prosternal process with weak grooves along its lateral margins, apex round. Mesoventrite (Fig. 13) with anterior edge emarginate with raised border for entire length; mesoventral process smooth, broader than coxal diameter; meso-metaventral articulation with suture straight. Scutellum small, triangular. Elytra at base broader than pronotum; dually punctate with punctures almost the same size; humeral angles well developed; lateral margins narrow, visible from above throughout; elytral epipleuron complete, smooth, with submarginal carina complete; metaventrite with intercoxal process broadly bordered; metaventral postcoxal lines forming straight line with two rounded, setose projections, laterally complete, straight; metaventrite with discrimen complete (Fig. 13).

Legs short and stout (Fig. 13), not protruding from outer margin of elytral epipleuron. Trochanters roundly produced, with cavities on their inner surfaces for receiving tip of tibiae in repose. Femora cylindrical with weak grooves throughout for receiving tibiae. Tibiae with apical spurs of formula 1–2–2, protibiae with weak grooves along entire length for receiving tarsi, mid and hind tibiae on outer edge near apex with oblique carina; tarsal claw double with additional large, subquadrate basal tooth (Fig. 10).



FIGURES 1–14. *Mada andeana* sp. nov.; 1) habitus, dorsal, typical form; 2) habitus, anterior, typical form; 3) habitus, dorsal, pale form; 4) habitus, anterior, pale form; 5) abdomen, female; 6) sternite VIII, female; 7) abdomen, male; 8) ventrite 6, male; 9) tergite VIII, male; 10) tarsal claw; 11) tegmen and penis, lateral; 12) tegmen, ventral; 13) ventral side; 14) female genitalia, ventral.

Abdomen with six ventrites in males and five ventrites in females (ventrite 6 detached from male abdomen in Fig. 8). Abdominal postcoxal lines recurved angulately and incomplete, reaching 3/4 length of ventrite 1 (Figs. 5,

7). In males apical margin of ventrite 5 weakly truncate (Fig. 7); ventrite 6 emarginate medially (Fig. 8); tergite VIII rounded (Fig. 9). Apodeme of male sternum IX simple, thin, rod-like. Tergite X subtriangular. In females apical margin of ventrite 5 rounded (Fig. 5); sternite VIII weakly truncate medially (Fig. 6), tergite VIII rounded. Proctiger (TX) membranous, sclerotized only at apical part, transverse, weakly truncate apically.

Male terminalia and genitalia (Fig. 11, 12). Penis guide symmetrical, widest in mid part in lateral view, with pointed apex; slightly longer than parameres. Parameres well developed, simple, setose apically. Penis base with T-shaped capsule. Penis rod-like, slightly curved apically, with truncate and slightly broadened apex.

Female genitalia (Fig. 14). Coxites suboval, about as broad as long, with inner margins rounded, styli present. Bursa copulatrix ending with sperm duct; sperm duct short, simple; spermatheca small, membranous, vermiform, without clear nodulus and ramus; accessory gland longer than spermatheca. Oviduct diverges in mid part of spermatheca, with symmetrical sac-like structures.

Type material. **Holotype**, male, Ecuador, Napo prov., Cosanga vic., near river 1900 m., 00°34'42.3"S/ 77°51'59.3"W, 25.XI.2009, leg. L. Borowiec (DBET). **Paratypes**, ECUADOR: Ecuador, Napo prov. Cosanga vic., Yanayacu Biol. Station, 2000–2200 m., 00°35'S/ 77°53'W, 23.XI–17.XII.2009, leg. L. Borowiec (2: LBC; 1: MZPW); Ecuador, Napo prov., Cosanga vic., near river 1900 m., 00°34'42.3"S/ 77°51'59.3"W, 25.XI.2009, leg. L. Borowiec (8: LBC; 4: MZPW); Ecuador, Napo prov., Cosanga vic., Yanayacu St.-Rio Aliso road 2000–2200 m., 00°35'S/ 77°53'W, 30.XI.2009, leg. L. Borowiec (4: LBC; 1: MZPW); Ecuador 1, Napo prov., Cosanga vic. Yanayacu Station, 2000–2200 m, 00°35'S/ 77°53'W, 23–24.XI.2009, leg. Rafał Ruta (1: RRC); Ecuador 37, Napo prov., Cosanga vic. Yanayacu hill above station 2000–2200 m, 00°35'S/ 77°53'W, 1.XII.2009, leg. Rafał Ruta (1: RRC); same data but Ecuador 73, 17.XII.2009 (2: DBET); same data but Ecuador 75 16.XII.2009 (1: DBET); PERU: Ingenio 27.7.70 (Peru), E. Pisfil, meunprogn 122-71, Mada sp., det. R. Gordon 92 (1: USNM).

Distribution. Ecuador, Peru (Fig. 15).



FIGURE 15. *Mada andeana* sp. nov. distribution map.

Mada inepta (Gorham, 1898)

Epilachna inepta Gorham, 1898: 245.—Korschefsky, 1931: 63; Blackwelder, 1945: 441.

Mada inepta: Gordon 1975: 229.—Jadwiszczak and Węgrzynowicz, 2003: 201.

Mada durantae González et Gómez, 2013: 44.—Gómez and González 2013: 137. **New synonymy**

Material examined. *Lectotype* of *Mada inepta* (Gorham): Type// Syntype// Presido, Mexico, Forrer// E. inepta Gorham// B.C.A., Col., VII. *Epilachna inepta* Gorh.// *Lectotype* *Epilachna inepta* Gorham, Gordon 1970 (NHM). **Other material:** MEXICO: Playa vicente// 2322// E. inepta G.// B.C.A., Coll., VII. *Epilachna inepta* Gorh.// Mexico Salle Coll. (1, NMH); EL SALVADOR: 2000m, Cerro Verde, El Salvador, V.4.1971, H. Howden (2, USNM); COLOMBIA: Antioquia, Medellín, Instituto Tecnológico [Institución Universitaria Tecnológico de Antioquia], 1650 m., 5-VIII-2012, leg. Luis Gómez, on *Duranta variegata* (4, MZPW); PANAMA: Panama, Chiriqui Prov. 2km W Cerro Punta, 1720m 8°51'N 82°36'W 19–23.V.77, H.&A. Howden (10, USNM).

Remarks. I received several specimens of *M. durantae* González et Gómez from Guillermo González and examined male and female genitalia. I compared them to the lectotype of *M. inepta* (Gorham). Male genitalia of the lectotype and Colombian specimens are identical to each other and also to drawings by Gordon (1975: 311). Dorsal colour pattern is very similar, but the lectotype of *M. inepta* is a bit paler and lacks the black sutural striae present in specimens described by González et Gómez. However, I believe the specimens referred to as *M. durantae* fall within the range of variation of *M. inepta*. As a result *M. durantae* González et Gómez, 2013 is here synonymized with *M. inepta* (Gorham, 1898).

Distribution. Colombia, Costa Rica, El Salvador, Mexico, Panama.

Discussion

The newly described species *Mada andeana* has typical characteristics of the genus, such as a double tarsal claw with an additional large tooth at base, oblique carina at apex of the tibia and two rounded, setose projections at anterior margin of metaventrite. However, it is very distinctive because of its glabrous elytral surface and distinctive male genitalia, which show some similarities with other species close to the type species, *M. fraterna* (Mulsant).

Gómez & González (2013) discovered that *M. durantae* (= *M. inepta*) feed on *Duranta* spp. from plant family Verbenaceae. It was the first report of feeding of Epilachnini on plants of this family. Until then, only three plant families had been reported for New World Epilachnini: members of the genus *Dira* feed on Aristolochiaceae, and *Epilachna* on Cucurbitaceae and Solanaceae. It can be an important hint for future field work since other members of the genus *Mada* may be found on other species belonging to the family Verbenaceae, which is diverse in the Neotropics. Still, very little is known about host plants within the tribe Epilachnini.

Two membranous sacs in female reproductive system that are attached to the oviduct are regarded by Katakura (1981) as a place for storing sperm outside of the spermatheca. These structures were described in *Henosepilachna vigintioctomaculata* (Katakura 1981), subsequently in the genus *Figura* (Szawaryn 2014) and here in *M. andeana*. This character may be a potential synapomorphy for the tribe Epilachnini, since it has not been observed in other taxa of Coccinellidae.

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